Developing the Solar Model for the County of Los Angeles Solar Mapping Portal

Mitigating global climate change is a major challenge across the world. Local, regional, and national solutions all recognize renewable energy resources as a primary and cost-effective method to reduce greenhouse gas emissions. Solar power is a proven technology for meeting our energy needs while reducing our carbon footprint. California's passage of SB1, the "California Solar Initiative" will ensure solar power's prominence in the state by providing rebates for the installation of solar systems, and the streamlining of permitting by cities. The County, as a major electricity user, with facilities spread across a wide geography, is a natural test-bed for the implementation of solar energy systems. As a leader in the support of new technologies, the County can provide leadership while being fiscally responsible by reducing electricity costs by installing solar systems.

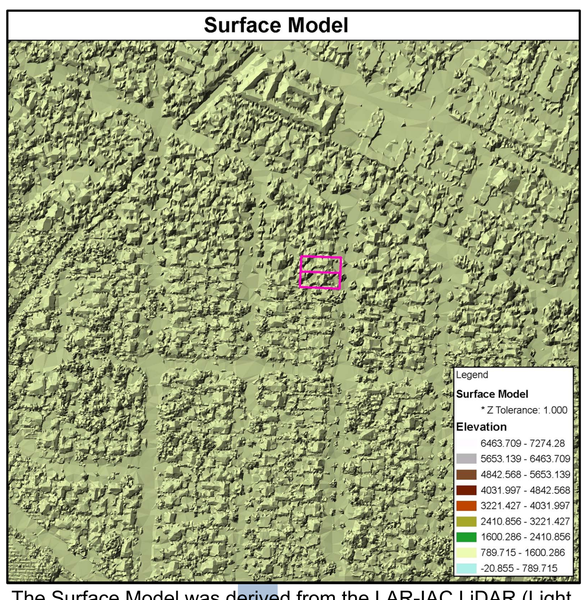
The decision to install a solar energy system is generally difficult because it involves complex factors such as: the solar electricity potential (based on geography and building characteristics), installation costs, availability of rebates, estimated energy savings, identifying reputable installation contractors, performing return on investment (ROI) calculations, and who to contact to get started.

A Solar Map will provide a simple and elegant solution. A Solar Map utilizes existing aerial imagery, solar potential software and a solar engineering model to provide potential solar installation information for any building. The San Francisco Solar Map is an integrated web site that provides all of this information to a building owner. By typing in an address, residents and businesses are given the information to support their decision to install solar systems. An example of the information provided is seen below. Their website is http://www.sf.solarmap.org.

To enhance the accuracy of the Solar Mapping Portal, the County is creating a detailed model of solar photovoltaic potential for every building in the County, utilizing the information from the Los Angeles Regional Imagery Acquisition Consortium (LAR-IAC). By increasing the accuracy of the solar potential displayed on the mapping site, interested parties will have more information at their fingertips when they go to make decisions regarding the installation of solar systems.

The development of this model is complex, as is shown by the diagram below, but will improve the accuracy of the information that will be displayed.

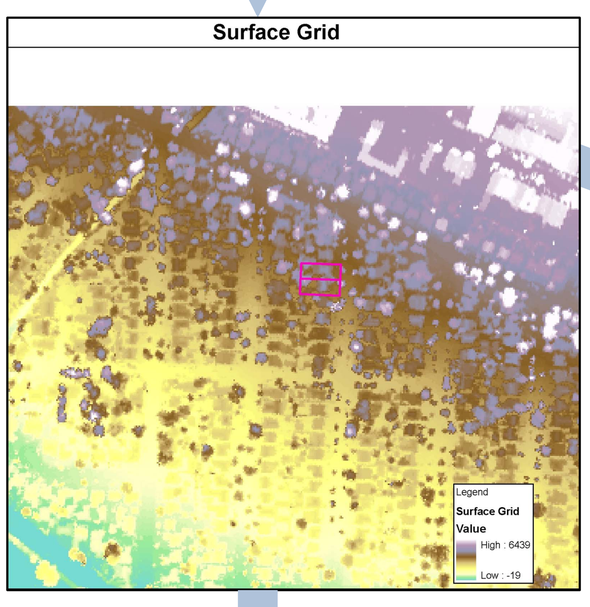
Surface Model



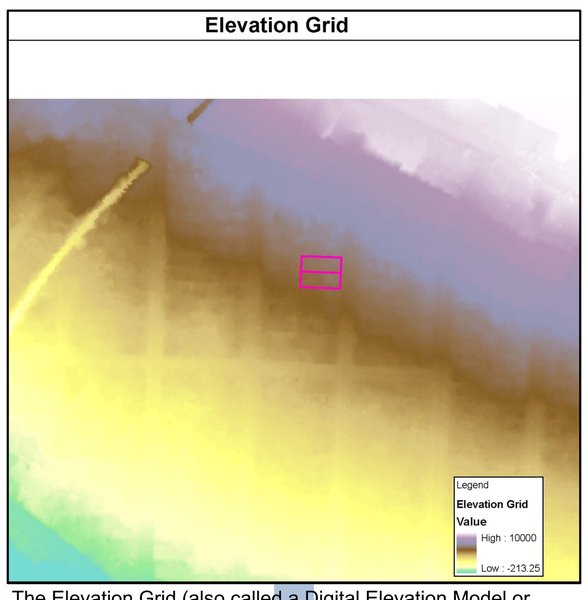
The Surface Model was derived from the LAR-IAC LiDAR (Light Detection and Ranging) surface, and is a triangulated model of the tops of buildings, trees, and other features.

The triangulated model was converted to a cell-based surface grid for further processing

Surface Grid



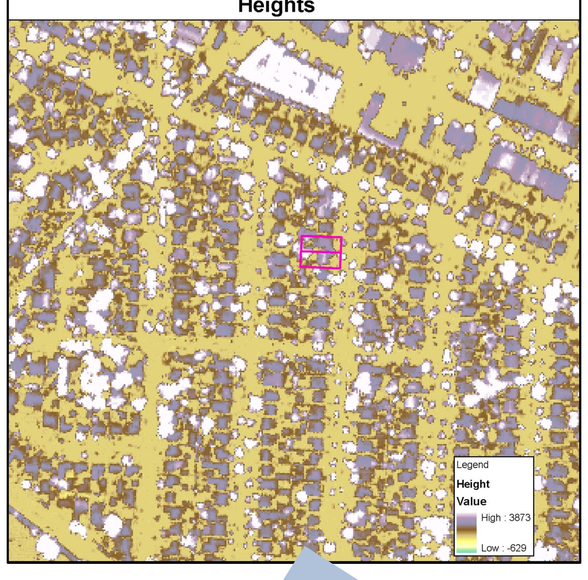
Elevation Grid



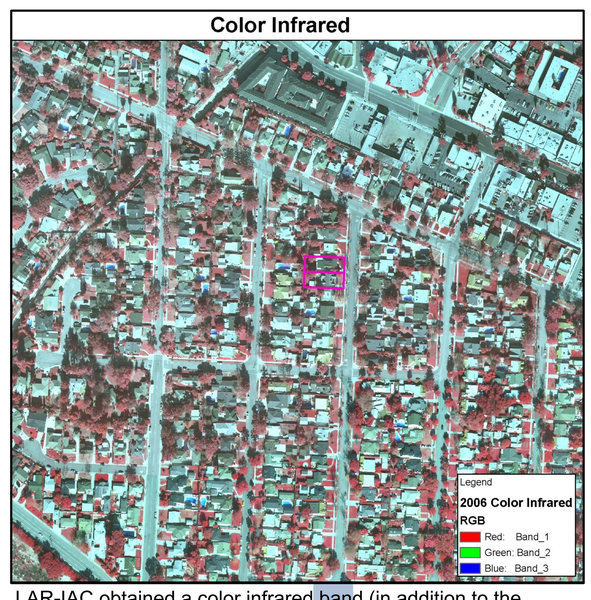
The Elevation Grid (also called a Digital Elevation Model or DEM) was a LAR-IAC product, and is a cell-based model of the earth's surface without of buildings, trees, and other features.

Ground Elevations were subtracted from the Surface Elevation Model to create a cell-based model of the heights of features (buildings, trees, etc)

Heights



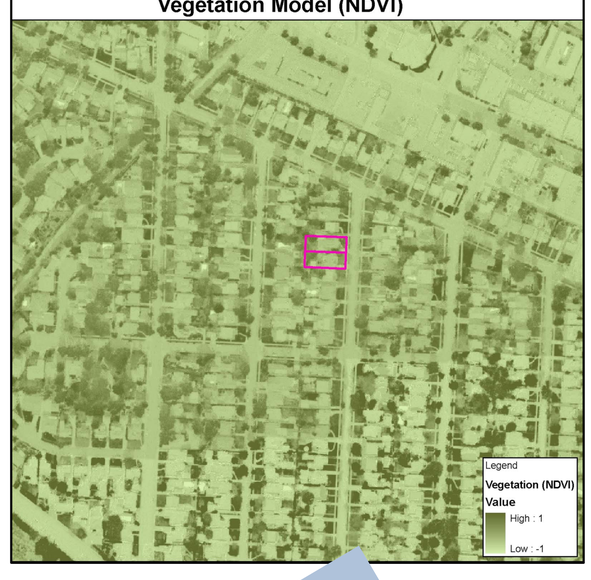
Color Infrared



LAR-IAC obtained a color infrared band (in addition to the normal red/green/blue) as part of its 2006 image capture. Vegetation turns red in this picture.

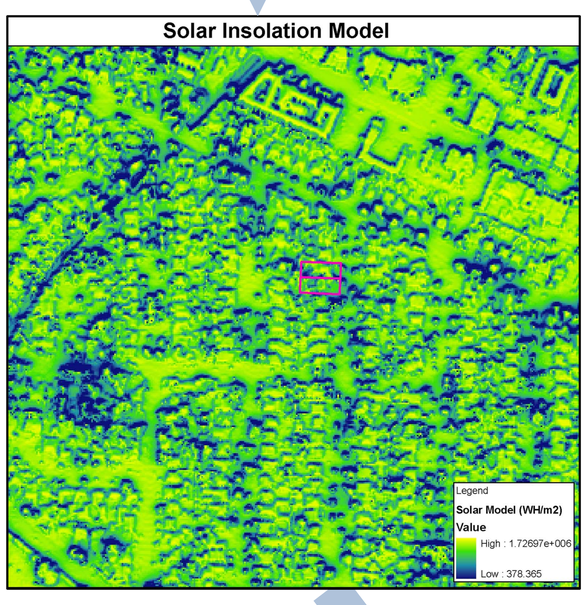
Normalized Difference Vegetation Index (NDVI) is a simple indicator for live green vegetation, calculated this way:
NDVI = (NIR band + RED band) / (NIR band – RED band)
Values greater than 0.1 are most likely green vegetation
Values less than 0.1 are things like buildings, streets, water, bare dirt.

Vegetation Model (NDVI)



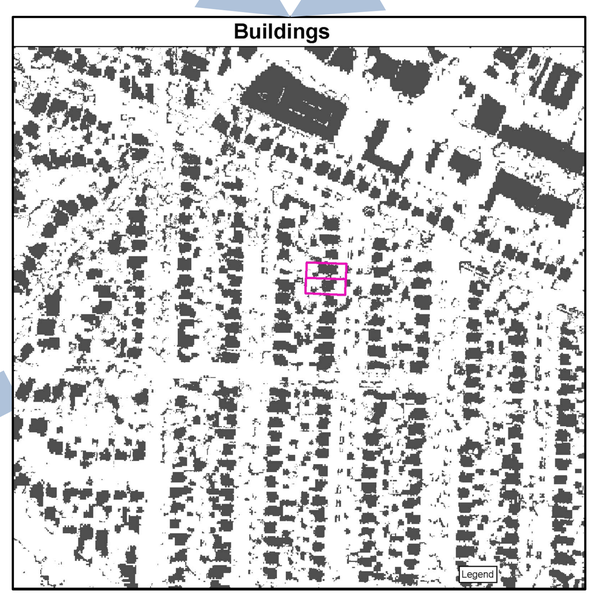
The Surface Model was used to generate a Countywide Solar Insolation Model using a GIS function that calculates the amount of sun that strikes a particular location on the ground during the course of an entire year.

Solar Insolation Model



Buildings were extracted by taking all areas with an NDVI value < 0.1 that also had a height > 8 ft

Buildings



The solar insolation model was combined with the building model to exclude areas that are not on buildings.

Solar Model for buildings

This picture shows the combined solar model on top of aerial photography.

At a property level, the final model provides the amount of sunlight that comes to each part of the roof

Solar Model for a property

This map shows the solar model, where each cell grid has been converted to a dot that represents the amount of energy for the 25 square feet the dot represents. The summaries of this information will be shown on the solar mapping portal for everyone to find.